Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AF1-280/AF2-182

"NELSON-LEE COUNTY"

AND

"NELSON-LEE COUNTY 345 KV II"

December 2024

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff. The Transmission Owner (TO) is ComEd.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a Solar Generating Facility in South Dixon, Lee County, Illinois with a designated PJM Project IDs AF1-280 and AF2-182.

The installed AF1-280 project facilities will have a maximum facility out of 200 MW (MFO) with 0 MW of this output being recognized by PJM as Capacity (MWC).

The AF2-182 project is a 300 MW addition (0 MW Capacity uprate) to AF1-280. The total installed facilities will have a capability of 500 MW (MFO) with 0 MW of the output being recognized by PJM as Capacity.

Project ID	MW Energy	Capacity Interconnection Rights (MW)
AF1-280	200	0
AF2-182	300	0
Total	**500**	**0**

2. POINT OF INTERCONNECTION (POI)

The AF1-280 Generating Facility will interconnect with the ComEd transmission system via a newly constructed 345 kV breaker and a half (BAAH) substation initially configured as a 3 breaker ring bus, TSS 953 Renner Road, tapping the TSS 155 Nelson – TSS 937 Lee County 345kV line, L.15501, approximately 9.0 miles from TSS 155 Nelson and approximately 4.0 miles from TSS 937 Lee County.

The construction of the new interconnection substation will result in the splitting of the existing 345 kV line L 15501 into two lines on the transmission system. The new 345kV Line L95303 will connect TSS 953 Renner Road to TSS 937 Lee County and the new 345 kV L15501 will connect TSS 953 Renner Road to TSS 155 Nelson.

The AF2-182 Generating Facility will interconnect with the ComEd Transmission System via a direct connection into the TSS 953 Renner Road 345 kV interconnection substation as stated above. The proposed generation interconnection is shown on the single line diagram in Attachment #1.

3. POINT OF CHANGE IN OWNERSHIP

The Point of Change of Ownership will be located at the first deadend structure for new TSS903 South Dixon Duke – TSS 953 Renner Road 345kV line L95301 inside the new TSS 953 Renner Road substation fence line.

4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

Project Developer will design, build, own, operate and maintain the Project Developer Interconnection Facilities on Project Developer's side of the Point of Change in Ownership (PCO).

4.1 At the new AF1-280 South Dixon Duke Collector Substation, in general, the following are project specific notes. The Project Developer is responsible for the construction of the 200 MW maximum facility output Solar Farm and includes the following:

4.1.1 New 345kV AF1-280 collector substation shall comply with all applicable portions of PJM Protection Standards (PJM Manual 7) and PJM Transmission and Subsation Design Subcommittee Technical Requirements.

4.1.2 New 345kV L95301 generator lead line about 0.01 miles long from the generating facility 345 kV side to the point of change in ownership (Project Developer owned).

4.1.2 One (1) new Project Developer Owned 345 kV gas circuit breaker to auto-trip and isolate for critical gas level.

4.1.3 One (1) new Project Developer Owned Main Power Transformer rated at 135/170/225 MVA, 3 Phase, 345 kV Primary Wye Grounded, 34.5 kV Secondary Wye Grounded, 13.8 kV Tertiary Delta, Z=9.5% on 225 MVA base.

4.1.4 Project Developer to provide test reports for the Project Developer owned transformer, including the equipment's %Z impedance and load loss, and the impedance and length of the generator lead line from the generating facility to PCO.

4.1.5 Installation of a breaker failure relay and scheme including DTT per standards outlined in PJM manual 7 and ComEd standards for the 345 kV gas circuit breakers.

4.1.6 The Project Developer will install a SCADA system for interface with ComEd's SCADA system. Install 345 kV standard interconnection metering and telemetry to ComEd TSO including CB status, MW, MVAR, MWh and voltage values.

4.1.7 Power output from the Project Developer site shall be in accordance with the power quality standards contained in the IEEE Standard 519. The generating units and all associated equipment at the Project Developer site shall not introduce any distortion of ComEd's waveform or telephone or carrier interference that is inconsistent or conflicts with such standard.

4.1.8 Project Developer shall provide shunt reactive compensation as required by the PJM Interconnection studies

4.1.9 At AF1-280 collector station, in general, project developer to follow section 6.1 (Design F) of the latest version of ComEd Interconnection Guidelines for Generators at Transmission Level (Rev 2: Effective 12/16/2021).

4.1.9.1 New gas circuit breakers to auto trip and isolate for critical gas level.

4.1.9.2 New Tie Line terminal relay types to be the same as ComEd terminal relays. This includes relay firmware versions.

4.1.9.3 ComEd Protection and Control Engineering must review all project developer relay protection design drawings and relay settings.

4.1.9.4 Project Developer equipment impedance and/or test data must be provided to ComEd Protection and Control Engineering to model in a short circuit program. Examples include lines, transformers (include percent impedance and load loss), wind turbines, and inverters.

4.1.9.5 Project Developer to include over/under frequency and voltage protection at wind/solar farm collector bus.

4.1.9.6 Suggested settings will be provided by ComEd. Under-frequency settings are to comply with MAIN Guide 1B.

4.1.9.7 Dual bus protection for 34.5kV bus.

4.1.9.8 Dual TRFM protection and site protection must be compliant with NERC & PJM requirements.

4.1.9.9 Metering is required to be installed per ComEd & PJM standards.

4.1.9.10 SCADA interface to ComEd will be required.

4.1.9.11 Witness testing by ComEd or Designated Authority will be required and must be pre-scheduled at least 90 days in advance.

4.1.10 At AF1-280, for 345kV line L95301, project developer to install standard ComEd 345kV generator interconnection interface relaying for the remote end of a digital substation (DSS) G2 design consisting of a dual SEL-411L-1 current differential scheme.

4.1.10.1 The ComEd Communication Specification of communication channels to support the addition of the new TSS 953 Renner Road substation.

345 kV Line 95301: Direct Fiber.

FUNCTION	TSS 953 RENNER RD.	AF1-280 S DIXON
411L – 87L-1: LTT, BFTT, LOAD-REJECTION (SYS1)	TRANSMIT RECEIVE	TRANSMIT RECEIVE
411L – 87L-2: LTT. BFTT, LOAD-REJECTION (SYS 2)	TRANSMIT RECEIVE	TRANSMIT RECEIVE
LOAD REJECTION TT IF AT TSS953 – BOTH BTS 1-3 & 2-3 ARE OPEN.		

4.1.11 Project developer shall design and install two new Fiber paths (~0.01 miles each), Single Mode Fiber, minimum count of 48 for each cable, both cables to

be physically diverse from the other, project developer/owned maintained between TSS 953 and TSS 903 South Dixon-Duke for L95301. See PJM Interconnection guidelines for additional details regarding termination and change in ownership for fiber optic paths.

4.1.12 Project developer to send a Transfer Trip to TSS 953 Renner Rd for TR 345kV CB Breaker Failure. Ability to isolate 87L and DTT functions is required. Example scheme/settings can be provided by ComEd.

4.1.13 At AF1-280, install 3 phase 3000:1 CCVTs on 345kV side of transformer to be used for System 1 and System 2 relay protection.

4.1.14 For any new equipment connected to the BES (Bulk Electric System rated at 100kV or above) the associated primary/System 1 and secondary/System 2 protective schemes to have a minimum redundant:

4.1.14.1 Connected CTs (where available)

4.1.14.2 PT secondary (where available)

4.1.14.3 DC control circuits

4.1.14.4 Auxiliary trip relays

4.1.14.5 Circuit breaker trip coils (where available)

4.1.14.6 Communication circuitry

4.1.15 ComEd shall supply and own any AMI meter devices. Project Developer shall be responsible for conveying access for any ComEd AMI metering equipment.

4.1.16 The solar farm shall, at a minimum, be required to provide the Transmission Provider with site-specific meteorological data including:

4.1.16.1 Plane of Array (POA) Irradiance (Watts/meter^2)

4.1.16.2 Back Panel Temperature (Degrees Fahrenheit)

4.2 At the new AF2-182 South Dixon Duke Collector Substation, in general, the following are project specific notes. The Project Developer is responsible for the construction of the 300 MW maximum facility output Solar Farm and includes the following:

4.2.4 New 345kV AF2-182 collector substation facilities shall comply with all applicable portions of PJM Protection Standards (PJM Manual 7) and PJM Transmission and Substation Design Subcommittee Technical Requirements.

4.2.5 New 345 kV generator lead line L95301 from the generating facility 345 kV side to the 345 kV bus connected to the existing L95301.

4.2.6 Project Developer shall provide limiting Transmission Facility ratings for their portion of 345KV L95301, in accordance with NERC FAC-008, FERC Order 881 and PJM Operational requirements for normal and emergency ratings from -55F to 130F in 5F increments.

4.2.7 All Developer Interconnection Facilities shall comply with applicable requirements of Exelon Utilities Transmission Facility Interconnection Requirements dated January 1, 2024 and ComEd Interconnection Guidelines (For Generators at Transmission Level) dated December 16, 2021. The ComEd Interconnection Guidelines (For Generators at Transmission Level) dated

December 16, 2021 and Exelon Utilities Transmission Facility Interconnection Requirements dated January 1, 2024 are available on the PJM website.

4.2.8 One (1) new project developer owned 345 kV gas circuit breaker.

4.2.9 One (1) new Project Developer Owned Main Power Transformer rated at 135/170/225 MVA, 3 Phase, 345 kV Primary Wye Grounded, 34.5 kV Secondary Wye Grounded, 13.8 kV Tertiary Delta, Z=9.5% on 225 MVA base.

4.2.10 Project Developer to provide test reports for the customer owned transformer, including the equipment's %Z impedance and load loss, and the impedance and length of the generator lead line from the generating facility to PCO.

4.2.11 At AF2-182 collector station, in general, Project Developer to follow section 6.1 (Design F) of the latest version of ComEd Interconnection Guidelines for Generators at Transmission Level (Rev 2: Effective 12/16/2021).

4.2.12 New gas circuit breaker to auto trip and isolate for critical gas level.

4.2.13 ComEd Protection and Control Engineering must review all customer relay protection design drawings and relay settings.

4.2.14 Project Developer equipment impedance and/or test data must be provided to ComEd Protection and Control Engineering to model in a short circuit program. Examples include lines, transformers (include percent impedance and load loss), solar panels, and inverters.

4.2.15 Modify existing (planned) 345 kV L95301 relay protection schemes to accommodate new interconnection AF2-182.

4.2.16 The Project Developer Facility shall be designed to remain in service (not trip) for voltages and times as specified for the Eastern Interconnection in Attachment 1 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low voltage conditions, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).

4.2.17 The Project Developer Facility shall be designed to remain in service (not trip) for frequencies and times as specified in Attachment 2 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low frequency condition, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).

4.2.18 The wind, solar or non-synchronous generation facility shall provide SCADA capability to transmit data and receive instructions from the Transmission Provider to protect system reliability. The Transmission Provider and the wind, solar or non-synchronous generation facility Project Developer shall determine what SCADA information is essential for the proposed wind, solar or non-synchronous generation facility, taking into account the size of the facility and its characteristics, location, and importance in maintaining generation resource adequacy and transmission system reliability in its area.

4.2.19 Project Developer to include over/under frequency and voltage protection at wind farm collector bus.

4.2.20 Suggested settings will be provided by ComEd. Under-frequency settings are to comply with MAIN Guide 1B.

4.2.21 Dual bus protection for 34.5kV bus.

4.2.22 Installation of a breaker failure relay and scheme including DTT per standards outlined in PJM manual 7 and ComEd standards for the 345 kV gas circuit breakers.

4.2.23 The Project Developer will install a SCADA system for interface with ComEd's SCADA system. Install 345 kV standard interconnection metering and telemetry to ComEd TSO including CB status, MW, MVAR, MWh and voltage values. Project Developer to co-ordinate updated metering/breaker status data exchange with ComEd SCADA Engineering.

4.2.24 Power output from the Project Developer site shall be in accordance with the power quality standards contained in the IEEE Standard 519. The generating units and all associated equipment at the Project Developer site shall not introduce any distortion of ComEd's waveform or telephone or carrier interference that is inconsistent or conflicts with such standard.

4.2.25 Dual TRFM protection and site protection must be compliant with NERC & PJM requirements.

4.2.26 Metering is required to be installed per ComEd & PJM standards.

4.2.27 Witness testing by ComEd or a DA will be required and must be pre-scheduled at least 90 days in advance.

4.2.28 Project Developer to send a Transfer Trip to TSS 953 Renner Rd for TR 345kV CB Breaker Failure. Ability to isolate 87L and DTT functions is required. Example scheme/settings can be provided by ComEd.

4.2.29 For any new equipment connected to the BES (Bulk Electric System rated at 100kV or above) the associated primary/System 1 and secondary/System 2 protective schemes to have a minimum redundant:

4.2.29.1 Connected CTs (where available)

4.2.29.2 PT secondary (where available)

4.2.29.3 DC control circuits

4.2.29.4 Auxiliary trip relays

4.2.29.5 Circuit breaker trip coils (where available)

4.2.29.6 Communication circuitry

4.2.30 ComEd shall supply and own any AMI meter devices. Project Developer shall be responsible for conveying access for any ComEd AMI metering equipment.

4.2.31 A project developer with a proposed new Generating Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Generator Interconnection Agreement as well as section 4.3 of PJM Manual 14D for additional information.

4.2.32 The solar farm shall, at a minimum, be required to provide the Transmission Provider with site-specific meteorological data including:

4.2.32.1 Plane of Array (POA) Irradiance (Watts/meter^2)

4.2.32.2 Back Panel Temperature (Degrees Fahrenheit)

B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AF1-280 and AF2-182 project to ComEd transmission system. These facilities shall be designed according to ComEd Applicable Technical Requirements and Standards. Once built, ComEd will own, operate, and maintain these Facilities.

1. **TRANSMISSION OWNER INTERCONNECTION FACILITIES:**

   A 345 kV dead end structure and foundation within the fence of the new TSS 953 Renner Road Interconnection Substation, to terminate the Project Developer's generator lead line.

   Line conductor from the dead-end structure to the bus position in the switchyard at the interconnection substation TSS 953 Renner Road.

2. **STAND ALONE NETWORK UPGRADES:**

NEW INTERCONNECTION SUBSTATION:

TSS 953 RENNER ROAD

The scope of work for the interconnection substation TSS 953 Renner Road is listed below:

2.1 The new TSS 954 Renner Road Substation shall be constructed as a generation hub as defined in ComEd Interconnection Guidelines, adjacent to existing ComEd 345kV L15501 transmission right-of-way (ROW) approximately 9.0 miles from TSS 155 Nelson and 4.0 miles from TSS 937 Lee County substations.

2.2 The arrangement, design, and construction of new TSS 953 Renner Road Substation shall be as per substation general arrangement provided in attachment 2. Proposed arrangement and configuration shall be subject to modification and change upon determinations of detailed design calculations and studies to meet ComEd Transmission and Substation (T&S) design standards, Good Utility Practices, the National Electrical Code, the National Electrical Safety Code, North America Electric Reliability Corporation, Reliability First Corporation, PJM standards including the PJM Transmission and Substation Design Subcommittee Technical Requirements, ComEd planning criteria and guidelines, and all applicable laws and regulations.

2.3 All installations to be owned by ComEd shall be engineered, procured, and constructed by ComEd approved contractors and vendors and use ComEd standards/specifications with ComEd oversight and approval.

2.4 The new substation footprint shall consist of an initially developed rectangular parcel including a fenceline footprint of approximately 774' by 472' arranged to facilitate ultimate expansion of substation as necessary.

2.5 The new substation fenceline shall meet all applicable ComEd Security and technology requirements. The substation shall have a minimum of two (2) 20' vehicular access gates and one (1) pedestrian access gate.

2.6 A 72' by 32' masonry or precast concrete control building shall be provided for housing new control, relay, SCADA, communication, and auxiliary equipment. The control building shall be design to meet or exceed all applicable code requirements in addition to ComEd and PJM technical design standards. The new control building shall include provisions for future expansion along the shorter side of the structure.

2.7 Install new 345kV, 1300kV BIL breaker-and-a-half (BAAH) ultimate substation arrangement initially installed as three breaker ring bus.

2.8 Install three (3) 345kV 2.0-cycle IPO circuit breaker with a minimum nameplate capability of 3282/3534/4224/5046A (1961/2112/2524/3015MVA) SN/SLTE/SSTE/SLD continuous, and interrupting capability of 63kA at -40°F. Circuit Breaker to be equipped with a motor operated disconnect switch (MOD) on both sides of the breaker. All equipment associated with the breaker terminations should meet or exceed the thermal capability of the breaker including CB disconnects, leads, CTs, metering, relays, etc. Nameplates to reflect actual maximum capability of equipment (NOT minimum requirements specified).

2.9 Install nine (9) 345kV motor operated disconnect (MOD) having a minimum thermal capability of 3282/3534/4224/5046A(1961/2112/2524/3015 MVA) SN/SE/SLD. Six (6) MOD's shall be installed for new 345kV circuit breakers, and three (3) shall be install on 345kV Line termination positions.

2.10 Install three (3) new 345kV transmission deadend structures.

2.11 Install nine(9) new 345kV voltage rating, 212kV MCOV station class surge arresters (three [3] per line position).

2.12 Install three (3) 345kV revenue metering CT and CCVT units at POI for metering of new L93501.

2.13 Install fifteen (15) 345kV CCVT's for bus and line relay and metering.

2.14 Install lightning masts and shield wire per ComEd design standards as determined utilizing rolling sphere method of IEEE 998

2.15 Install substation ground grid and grounding as per PJM and ComEd Design Standards in accordance with IEEE 80/81 utilizing site specific soil modeling and ultimate anticipated fault currents of 63kA 1-phase symmetrical, 63kA 3-phase symmetrical, and 100kA maximum momentary assymetrical.

2.16 Substation cable trough, trenches, conduit, ducts, and trays shall be provided for all control, power, communication, and fiber connections to allow for installation, maintenance, replacement, and expansion. Redundant or isolated paths shall be employed as per ComEd design standards to ensure reliability of substation.

2.17 Substation lighting shall be installed for safety, security, and operation of

substation as per ComEd design standards.

2.18 Equipment access platforms or stairs shall be installed as necessary for safe operation and maintenance of equipment.

2.19 Install new three phase 208/120VAC auxilliary AC power system including redundant discrete sources as per ComEd reliability guidelines feeding padmount transformers sized for station ultimate loading. Aux AC system shall include all necessary disconnect switches, automatic transfer switches, panelboards, circuit breakers, load centers, etc to safely and reliably operate substation.

2.20 Install redundant 125VDC battery and control systems sized for substation ultimate installation including battery chargers, DC disconnects, DC panelboards, and associated equipment.

2.21 Install new 345kV bus, conductors, connectors, and support structures to provide general arrangement provided in attachment #2. All bus and equipment shall be designed to meet and or exceed connected equipment and/or line thermal rating capabilities in addition to maximum expected ultimate fault currents of: 63kA 1-phase symmetrical, 63kA 3-phase symmetrical, and 100kA maximum momentary assymetrical. Positioning of bus support structures and sizing of bus shall require bus calculations to determine exact placement and number of bus support structures.

2.22 Real estate shall include access drive from nearby IL Route 26. Access drive shall be designed to allow ingress and egress of all necessary construction equipment, material deliveries, and employee access.

2.23 Substation drainage shall be reviewed and designed for effective stormwater management of new substation. All necessary drainage management facilities shall located external to the proposed substation footprint. All drainage facilities associated with installations to be owned by ComEd shall be exclusive of interconnect project developer facilities and shall be under the exclusive control and ownership of ComEd. Drainage facilities shall adhere to all local, state, and federal regulation including all necessary permitting processes.

2.24 Install communications for other voice/data services, including Plain Old Telephone Service (POTS) lines, Fire Protection, LAN/Internet, etc.

2.25 New substation control building shall contain all new relay, meter, control, communication, and SCADA panels designed per ComEd design standards. Control building shall also include redundant HVAC systems properly sized for building heating loads and site environmental conditions, building lighting and auxilliary systems, substation batteries, desk, filing cabinet, fiber distribution panels, marshalling cabinets, fire system, SEL-ICON fiber nodes, panelboards, disconnects, cable tray, security system, and other provisions necessary for safe and reliable operation of the substation.

2.26 ComEd shall have oversight and review of all design and construction for facilities to be owned by ComEd. ComEd shall provide all necessary relay and device settings

2.27 Additional clarification, definition, and justification for substation design requirements may be found in ComEd Interconnection Guidelines (For Generators at Transmission Level) Rev2.

2.28 ComEd shall provide legal support and oversight for the conveyance of all necessary real estate ownership and easements to ComEd from the interconnection project developer.

2.29 The interconnection project developer shall be responsible for obtaining all necessary real estate for interconnection facilities. Real estate shall meet ComEd requirements and free from defect or encumbrance that would inhibit ComEd's ability to utilize such real estate for stated purposes.

2.30 The Project Developer shall be responsible to bear the cost of any outages required on existing transmission or distribution lines that may be required for transport of large equipment.

2.31 All protection and control fiber optic installations shall be installed with physically diverse system 1 & system 2 pathing within and leaving the substation.

2.32 At TSS953 Renner Road all new relaying design shall conform to latest ComEd Digital Substation (DSS) Gen 2 IEC 61850 design specifications.

2.33 At TSS953 Renner Road SCADA network will be based on 61850 design at ESS E535.

2.33.1 One SCADA cabinet:

2.33.1.1 Three SEL-3555 RTACs for RTU, SysLog/SEL protocol concentrator, and Synchrophaser data concentrator.

2.33.1.2 Two SEL-3555 as redundant HMI, with each tied to its own mouse, keyboard, and monitor on the operator desk.

2.33.1.3 One SEL-2730M Ethernet switch as SCADA Master Switch.

2.33.1.4 One Omicron RBX1 Station Scout

2.33.1.5 One SEL-3350 RTAC for customer data. Install one pair of serial fiber connections for each Project Developer RTU data exchange.

2.33.2 Two Station Bus network cabinets (A and B):

2.33.2.1 One master SEL-2741 switch

2.33.2.2 One SEL-2440 DPAC

2.33.2.3 One SEL-2488 GPS Clock

2.33.2.4 One SEL-3350 Blueframe Flow Controller

2.33.2.5 One Ruggedcom RST2228 Ethernet Switch

2.33.2.6 One Ruggedcom RSG910C Switch with two 1000BASE-SX SFPs

2.33.3 Connect metering group-provided revenue meter to station IP architecture.

2.33.4 Confirm latest device model numbers and GDD with the assigned SCADA engineer.

3. NETWORK UPGRADES

3.1 Details pertaining to Transmission Line L15501 Cut-In to loop TSS 953 Renner Road to the ComEd 345 kV system :

3.1.1 ComEd will be responsible for performing the design, procurement, construction, and testing at Project Developer cost to install new line facilities which will connect the existing 345kV L.15501 circuit to the dead-end structures of

the new TSS 953 Renner Road substation. The existing L.15501 will be reconfigured to L.95303 between TSS 937 Lee County and TSS 953 Renner Road, and L.15501 between TSS 953 Renner Road and TSS 155 Nelson. See attachment #3.

3.1.2 The Project Developer will transfer the land ownership of this 345kV tap line corridor to ComEd prior to construction of the facilities. ComEd will provide legal support related to the transfer of ownership from South Dixon Solar, LLC to ComEd.

3.1.3 ComEd will be responsible to schedule and coordinate all transmission line outages necessary to make cut-in interconnect tie point connections.

3.1.4 Bundled Curlew ACSS/TW to be installed on the cut-in tap. No changes are necessary to existing conductors on L.15501 or L.95303. 7#6 Alumoweld to be installed on the cut-in tap. No static wire changes to existing static wire on L.15501 or L.95303.

3.1.5 Amount of circuit miles installed is approximated at 0.2 miles. Total length of wire needed is approximately 1.2 miles.

3.1.6 Please see table below for structure summary of structures needed for the cut-in.

Structure Number	Line Number	Existing Structure Type	Comments
48D	L.15501	N/A	Install new single-circuit horizontal configuration deadend steel pole
48E	L.15501	N/A	Install new single-circuit horizontal configuration deadend steel pole
49	L.95303	LSV+0	Remove existing tower. Install new single-circuit horizontal configuration deadend steel pole
49D	L.95303	N/A	Install new single-circuit horizontal configuration deadend steel pole

3.2 Details pertaining to Modifications at Existing ComEd Substations:

3.2.1 TSS 937 Lee Energy Center Scope:

3.2.1.1 Upgrade existing 345kV L15501 (new L95303) system 2 relay with new SEL-411L-1.

3.2.1.2 Modify and reset settings for existing relays.

3.2.1.3 Upgrade 345kV BT1-2 and 1-4 breaker failure relaying to SEL-451. Incorporate live tank CB and free-standing CT flashover protection in the new SEL-451s.

3.2.1.4 Remove existing BT1-2 and 1-4 50G flashover SEL-501s.

3.2.1.5 Remove existing BT1-2 and 1-4 SEL-279 reclosing relays.

3.2.1.6 Install one SEL-351A per BT to perform second reclose mode.

3.2.1.7 All protection and control fiber optic installations shall be installed with physically diverse system 1 & system 2 pathing within and leaving the substation.

3.2.1.8 Install SEL-3350 RTAC.

3.2.1.8.1 Serial Port 15 used for Remote Access

3.2.1.8.2 Serial Port 16 for SCADA Data

3.2.1.9 Install RST-2228 dual aux switch architecture for new relays.

3.2.2 TSS 155 Nelson Scope:

3.2.2.1 Upgrade existing 345kV L15501 System 2 Relay with new SEL-411L-1.

3.2.2.2 Modify and reset settings for existing relays.

3.2.2.3 Upgrade 345kV BT6-7 breaker failure relaying to SEL-451.

3.2.2.4 Remove existing BT6-7 SEL-279 reclosing relay.

3.2.2.5 All protection and control fiber optic installations shall be installed with physically diverse system 1 & system 2 pathing within and leaving the substation.

3.2.2.6 Connect new relays to existing dual aux switch architecture.

3.3 INSTALLATION OF FIBER CABLE CIRCUITS :

3.3.1 To provide reliable and secure relay protection communications to support installation of new TSS 953 Renner Road substation a new fiber multiplexer communication network and new fiber optic routes shall be installed. The new network will utilize SEL-ICON architecture with redundant fiber paths for system 2 protection.

3.3.2 L95303 – TSS 937 Lee County to TSS 953 Renner Road Fiber Connection (within ComEd energized ROW and substations) Scope:

3.3.2.1 Build (1) one new fiber path from TSS 953 Renner Road to TSS 937 Lee County for FiberMUX connection. Single Mode Fiber, shall be minimum count of 48, installed as physically diverse paths between TSS 953 and TSS 937 including physical diverseness from path to TSS 155, to be owned and maintained by ComEd.

3.3.2.2 New fiber optic paths shall include acquisition of all necessary property rights including but not limited to: deed conveyance, easement acquisition, ROW acquisition, permitting, and zoning. Necessary property rights shall include all necessary for installation, maintenance, and access of installed equipment.

3.3.2.3 New fiber optic path shall include the design and installation of all necessary ducts, poles, conduits, risers, handholes, manholes, pullboxes, signage, markers, identification, locate devices, trenching, fusion splicing, splice housings, terminations, pullropes, and such other equipment as per current ComEd fiber design standards.

3.3.2.4 All inter-substation fiber optic installations shall be installed with physically diverse pathing within, between, and leaving the substations.

3.3.3 L15501 – TSS 155 Nelson to TSS 953 Renner Road Fiber Connection

(within ComEd energized ROW and substations) Scope:

3.3.3.1 Build (1) one new fiber path from TSS 953 Renner Road to TSS 155 Nelson for FiberMUX connection. Single Mode Fiber, shall be minimum count of 48, installed as physically diverse paths between TSS 953 and TSS 155 including physical diverseness from path to TSS 937, to be owned and maintained by ComEd.

3.3.3.2 New fiber optic paths shall include acquisition of all necessary property rights including but not limited to: deed conveyance, easement acquisition, ROW acquisition, permitting, and zoning. Necessary property rights shall include all necessary for installation, maintenance, and access of installed equipment.

3.3.3.3 New fiber optic path shall include the design and installation of all necessary ducts, poles, conduits, risers, handholes, manholes, pull boxes, signage, markers, identification, locate devices, trenching, fusion splicing, splice housings, terminations, pull-ropes, and such other equipment as per current ComEd fiber design standards.

3.3.3.4 All inter-substation fiber optic installations shall be installed with physically diverse pathing within, between, and leaving the substations.

3.3.4 Fiber MUX - TSS 155 Nelson Scope:

3.3.4.1 Install new fiber MUX equipment (SEL-ICON) at TSS 155 Nelson. Including connections to outgoing FDP and station to station fiber connections for creation of new communication network.

3.3.4.2 All fiber paths shall be physically diverse system 1 and system 2 fiber paths.

3.3.5 Fiber MUX - TSS 937 Lee County Scope:

3.3.5.1 Install new fiber MUX equipment (SEL-ICON) at TSS 937 Lee County. Including connections to outgoing FDP and station to station fiber connections for creation of new communication network.

3.3.5.2 All fiber paths shall be physically diverse system 1 and system 2 fiber paths.

3.3.6 Fiber MUX – STA 6 Byron Scope:

3.3.6.1 Install new fiber MUX equipment (SEL-ICON) at STA 6 Byron. Including connections to outgoing FDP and station to station fiber connections for creation of new communication network.

3.3.6.2 All fiber paths shall be physically diverse system 1 and system 2 fiber paths.

3.3.7 Fiber MUX - TSS 144 Wayne Scope:

3.3.7.1 Install new fiber MUX equipment (SEL-ICON) at TSS 144 Wayne. Including connections to outgoing FDP and station to station fiber connections for creation of new communication network.

3.3.7.2 All fiber paths shall be physically diverse system 1 and system 2 fiber paths.

3.3.8 Fiber MUX - TSS 111 Electric Junction Scope:

3.3.8.1 Install new fiber MUX equipment (SEL-ICON) at TSS 111 Electric Junction. Including connections to outgoing FDP and station to station fiber connections for creation of new communication network.

3.3.8.2 All fiber paths shall be physically diverse system 1 and system 2 fiber paths.

3.3.9 Fiber MUX - TSS 113 Waterman Scope:

3.3.9.1 Install new fiber MUX equipment (SEL-ICON) at TSS 113 Waterman. Including connections to outgoing FDP and station to station fiber connections for creation of new communication network.

3.3.9.2 All fiber paths shall be physically diverse system 1 and system 2 fiber paths.

4. OTHER SCOPE OF WORK

None

5. MILESTONE SCHEDULE FOR COMPLETION OF COMED WORK

Facilities outlined in this report are estimated to take 60 months to construct, from the time the Generation Interconnection Agreement is fully executed. This schedule may be impacted by the timeline for procurement and installation of long lead items, the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Detailed Design	1	21
Permitting	21	50
Construction	50	60

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE.

6.1 ComEd estimate does not include costs of design and construction of South Dixon Duke Collector Substation Solar farm substation (AF1-280 & AF2-182) or any other Project Developer owned facilities. ComEd estimated schedule is based on Generator Interconnection Agreement (GIA) contract being executed by all parties.

6.2 This cost estimate assumes that all work will be performed during normal weekdays and with no overtime.

6.3 ComEd cost estimate is valid for one (1) year after System Impact Study released to PJM.

6.4 Transmission line outages for construction have not been identified, but generally are available from September to May. These outages are controlled by PJM.

6.5 The Project Developer will be responsible to request and bear the cost for relocation of existing transmission or distribution lines (including structures and other facilities) that may be required for transmission line crossings, the transport of any large equipment, such as turbines, rotors, turbine structures, cranes, etc.

6.6 This Facility Study is time dependent. If the project is not into construction within one year

of the issuance, the FS will be void and the project re-studied, requiring completion of a new FS.

6.7 All upgrades to facilities included in this document will be required to meet latest ComEd standards.

6.8 Upgrades are subject to change based on detailed design development.

6.9 It is assumed that all new equipment specified for installation at existing or proposed ComEd facilities can be located within existing structures without modification or impact to other existing equipment.

6.10 It is assumed that all new equipment specified for installation at existing or proposed ComEd facilities shall not require additional upgrades to station DC, AC, and SCADA systems beyond scope specified within this document.

6.11 It is assumed that ComEd facilities included in this document will not require a sound study or flood mitigation.

6.12 It is assumed that existing ComEd L15501 transmission route/ROW/real estate shall not be sufficient or utilized for installation of new station to station fiberoptic connections. This study assumes that additional sufficient real estate and right of way can and shall be acquired for the project specifications with a combined installation route of twice the length (26 miles) of L15501 transmission route (13 miles) per fiber route. It is assumed that new fiber shall be installed on distribution class poles.

6.13 This study assumes sufficient adequate fiber optic connections exist and are available for use to establish new FiberMux ring between TSS 937 Lee County, TSS 155 Nelson, TSS 111 Electric Junction, STA 6 Byron, TSS 144 Wayne, and TSS 113 Waterman substations including control house fiber distribution panels and terminations.

6.14 This study schedule assumes no project delays due to zoning, permitting, real estate/ROW acquisition, and route selection.

6.15 For new fiber paths detailed engineering and right of way acquisition may result in significant modifications to the estimated distances, schedules, costs, and scope.

6.16 This study assumes the new interconnection station service distribution source is located no more than 1 mile from the interconnection substation.

6.17 Costs are based on 2024 rates and do not reflect a potential increase in Labor or Material costs after 2024.

6.18 ComEd cost estimate is valid for six (6) months after Facilities Study release by PJM.

6.19 The Project Developer will be responsible to request and bear the cost for relocation of existing transmission or distribution lines (including structures and other facilities) that may be required for transmission line crossings, the transport of any large equipment, such as turbines, rotors, turbine structures, cranes, etc. Formal submittal of this request to ComEd's TSO for ultimate review by PJM can be made 7 months prior to back feed request date.

6.20 Foundation design assumes typical soil conditions at locations and will be subject to change after soil boring tests.

6.21 All upgrades to facilities included in this document will be required to meet latest ComEd standards.

6.22 Upgrades are subject to change based on detailed design development.

6.23 ComEd will complete pre-design and post construction survey for the transmission and substation upgrades, as required. This includes, but is not limited to, the LIDAR survey and video imaging for transmission lines. Costs associated with this are at the expense of the Project Developer. Pre-design survey must be completed prior to detailed engineering.

6.24 This study assumes that any additional right-of-way and/or easement work required will be at the expense of the Project Developer.

6.25 This Facilities Study is time dependent. If the project is not into construction within one year of the issuance, the study will be void and the project re-studied, requiring the completion of a new Facilities Study.

6.26 It is assumed that all associated network upgrades, as listed in the Phase 1 study, are complete prior to this new service request project being placed in service.

7. REVENUE METERING REQUIREMENTS

All revenue metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AF1-280 GIA, section 8 of the AF2-182 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in the ComEd Interconnection Guidelines posted on PJM website.

The revenue metering for measuring power output and the auxiliary power will be installed on the ComEd side of the Point of Change in Ownership and will be owned and maintained by ComEd. The revenue meters and associated CT/VT will be purchased and installed at Project Developer's expense and owned and maintained by ComEd.

- REVENUE METERING FOR PJM AND COMED
  - The revenue meter measures the wholesale energy output (Hourly compensated net MWH and Hourly compensated net MVARH) of the Generating Facility.
  - The metering equipment, including revenue meter and CT/PT shall be installed, at Project Developer's expense, at the interconnection substation on ComEd side of the Point of Change in Ownership.
  - ComEd shall own, operate, maintain, inspect, and test all the metering equipment as set forth in 'Testing of Metering Equipment' section of the PJM Tariff, at the Project Developer's expense.
- REAL-TIME METERING FOR PJM
  - The Project Developer shall install, own, operate, maintain, inspect, and test real-time metering equipment to measure and transmit directly to PJM the real time MW, MVAR, voltage and status of electrical equipment such as circuit breakers and Motor Operated Disconnect switches, in conformance with the requirements listed in PJM Manuals M-01 and M-14D, at the Project Developer's expense.
- RETAIL METERING FOR COMED
  - The AMI Meter measures the energy consumption by the Project Developer at transmission level and hence shall be designed to measure low MW flow.
  - The metering equipment including AMI Meter and CT/PT shall be installed at the interconnection substation on ComEd side of the POI, at the Project Developer's expense.

- ComEd shall own, operate, maintain, inspect, and test all the metering equipment as set forth in the 'ComEd Interconnection Guidelines'.

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

8.1 The Project Developer will purchase the real estate necessary and suitable to accommodate the construction of TSS 953 Renner Road substation including the control house and other related equipment, prior to the transfer of its ownership to ComEd, prior to commercial operation of AF1-280 and AF2-182 generating facilities. This shall include all appurtenant requirements including access roads and drainage facilities.

8.2 The Project Developer will be responsible to obtain the necessary right-of-way easement to install the 345 kV line taps to TSS 953 Renner Road substation.

8.3 The Project Developer will be responsible to obtain the necessary property rights to install physically diverse fiber optic cable on between TSS 155 Nelson, TSS 953 Renner Road, and TSS 937 Lee County.

8.4 All real estate must meet residential standards.

8.5 The Project Developer will be responsible to provide site access to ComEd with two entrances to the substation.

8.6 The Project Developer will be responsible to purchase real estate or obtain the necessary right-of-way easement for all upgrades and installations associated with this project, including the install of the transmission line tap to 345kV TSS 953 Renner Road substation and proposed fiber optic routing. These associated upgrades are not included in the costs listed in this study except permitting.

8.7 All Real Estate must include sufficient access rights and easements including necessary drive paths and driveways.

8.8 All right of way shall be meet the requirements in the ComEd Interconnection Guidelines posted on PJM website.

9. ENVIRONMENTAL AND PERMITING

9.1 Project Developer will be responsible to obtain environmental approvals required for the construction of 345kV TSS 953 Renner Road substation including associated transmission and fiber optic connections.

9.2 Project Developer will be responsible for remediation costs for locations found to have environmental contaminations and remediation. This may require contaminated soil disposal as well as lead paint removal for existing structure work.

9.3 Project Developer will be responsible for cost incurred if Army Corps of Engineers, county, and possibly municipal permits are needed including storm water permitting.

9.4 It is assumed that all necessary permits shall be obtained in a timely manner as to allow engineering and construction to proceed according to the Milestone Schedule

9.5 It is assumed that conveyance of property and rights will be obtained to support the PJM Transmission Outage Schedule

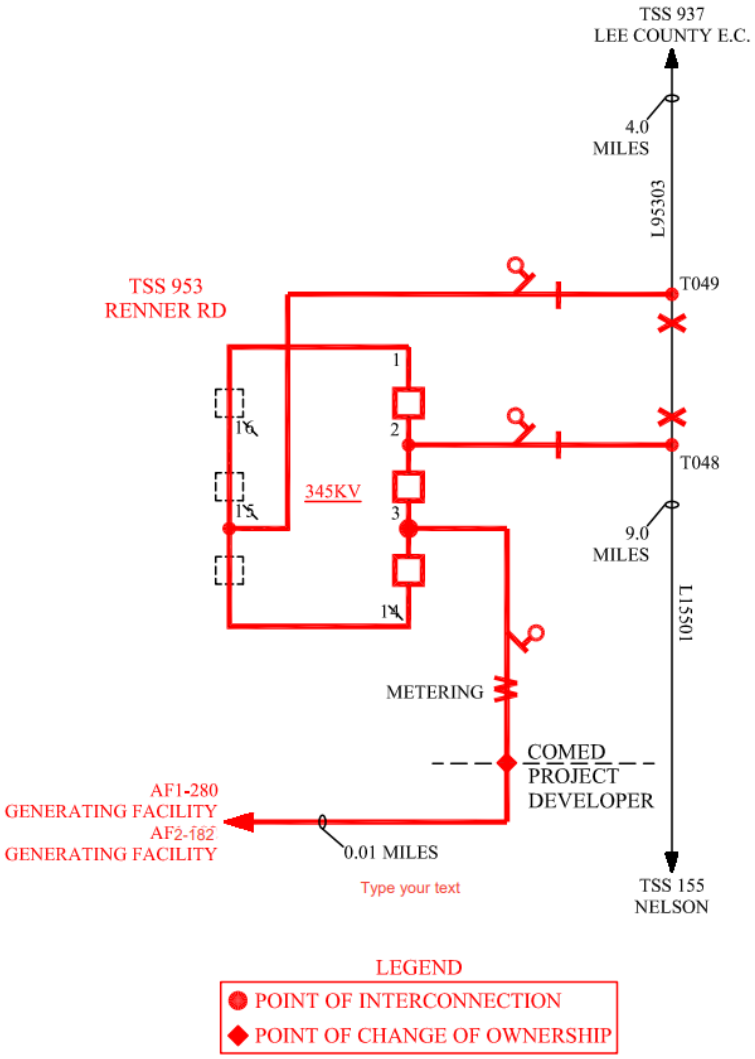
9.6 It is assumed that the required Environmental Study will yield no impediments to the development of the site.

9.7 Project Developer shall be responsible for ensuring all real estate and property for specified installations shall not be subject to restrictions as per applicable wetland, endangered species, cultural, etc. regulations including federal, state, county, and municipal level.

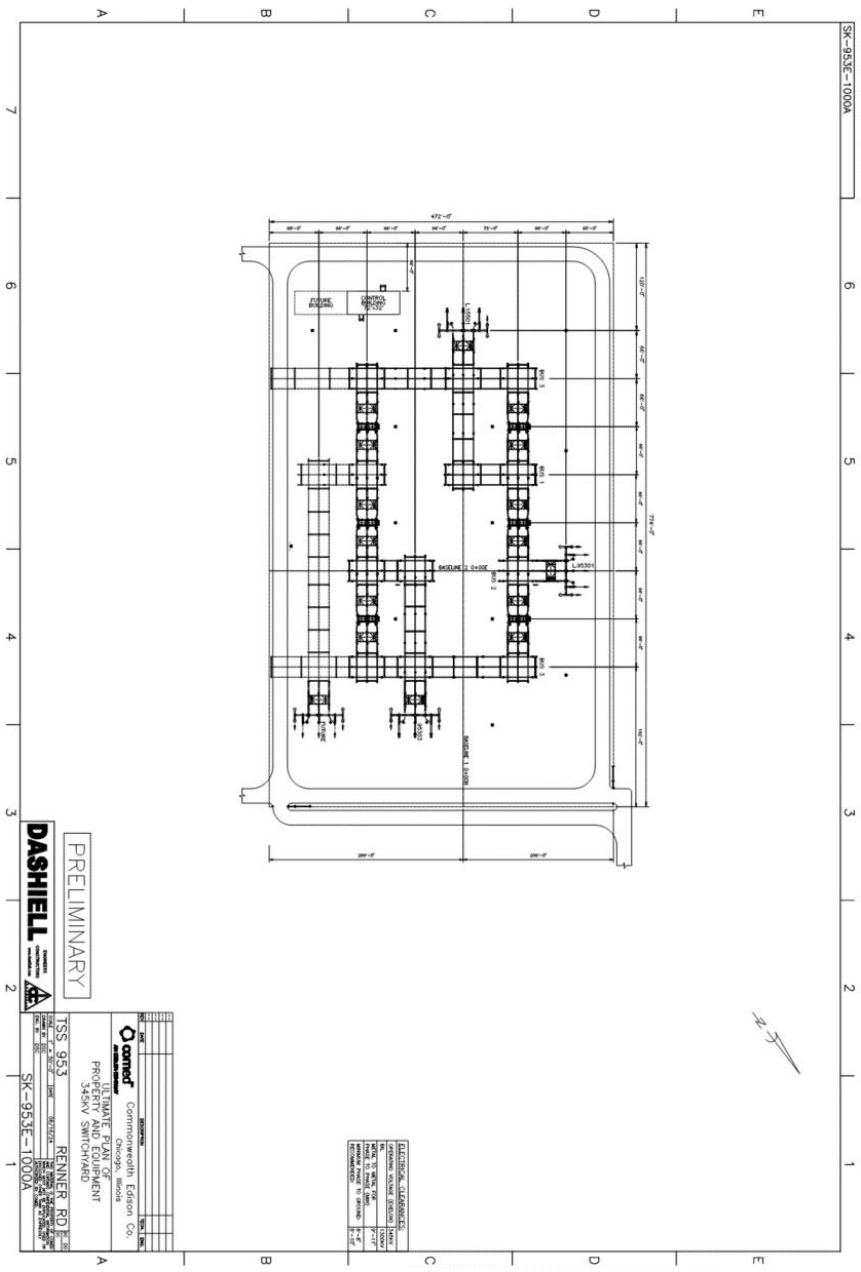
C. APPENDICES

Attachment #1: Single line Diagram for the Physical Interconnection

ATTACHMENT # 1.



ATTACHMENT 2: Proposed TSS 953 Renner Road Substation Arrangement.



ATTACHMENT 3: Proposed TSS 953 Renner Road Transmission Cut-in.


AF1-280 TRANSMISSION APPROXIMATE ROW SKETCH
100' (TYP)
NORTH
L95303
49 NEW
49D NEW
TERMINAL LINE 95303
ROW WIDTH OF 100' IS APPROXIMATED AND NEEDS TO BE DETERMINED IN DETAILED DESIGN
Existing L15501 Route
TERMINAL LINE
48E NEW
100' (TYP)
48D NEW
L15501